TEST REPORT

2021EP2048

DATE OF RECEPTION
28/06/2021

DATE TESTS
Starting: 28/06/2021
Ending: 23/09/2021

APPLICANT

TESAMED SAĞLIK HİZMETLERİ SAN TİC A.Ş.
ALTINTEPE MAH. İSTASYON YOLU SOK NO:3
MALTEPE
TR-34000 GAziosMANPAŞA

Att. SOMER TAHINCIOGLU

IDENTIFICATION AND DESCRIPTION OF SAMPLES

REFERENCES
Tesafire Fighter Suit 0025

TESTS CARRIED OUT

- PHOTOGRAPHY.
- PRE-TREATMENT FOR DOMESTIC WASHING AND DRYING PROCEDURES FOR TEXTILE TESTING.
- RESISTANCE OF MATERIALS TO PENETRATION BY LIQUID / *STANDARD.*
- WATER PENETRATION RESISTANCE. TEST UNDER HYDROSTATIC PRESSURE.
- LIMITED FLAME SPREAD / *STANDARD.*
- ERGONOMICS.
- HEAT RESISTANCE.
- DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE.

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Rev.1 *This revision cancels and replaces the previous*
Error by omission and/or duplication of results

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*Tests marked with * are not included within the scope of the ENAC accreditation*

ENSAYOS Nº12 / LE025 Nº12 / LE427

RESULTS

PHOTOGRAPHY

Reference

Tesafire Fighter Suit 0025

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RESULTS

PRE-TREATMENT FOR DOMESTIC WASHING AND DRYING PROCEDURES FOR TEXTILE TESTING

Standard
ISO 6330:2012

Standard deviation

Reference
Sample1 Tesafire Fighter Suit 0025

Units	1	2
Equipment	Wascator 13470E05	Wascator 13471E05
Dryer machine	JAMES HEAL 13472E05	JAMES HEAL 13473E05

Washing procedure 6N **Washing cycles** 5

Drying procedure
F (tumble dryer)

Washing powder
ECE detergent 98 + sodium perborate + TAED

Units	Dry mass of the samples	Counterweight mass	Equipment
1	1.66 Kg	0,30 Kg of Polyester	Wascator 13470E05
2	2.07 Kg	---	Wascator 13471E05

Start and finish date
05/07/2021 - 06/07/2021

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RESULTS

RESISTANCE OF MATERIALS TO PENETRATION BY LIQUID

Standard

EN ISO 6530:2005

Atmosphere for conditioning and testing

Temperatura *Temperature*	(20±2) ºC	**Humedad Relativa (HR)** *Relative Humidity (RH)*	(65±5) %

Flow

10 ml in 10 s

Mass per unit area approximate of the sample tested

Does not provided by the customer

Pre-treatment

5 washing cycles at 60ºC, according to standard ISO 6330:2012, method 6N; and F drying

Reference

Tesafire Fighter Suit 0025

Measurement uncertainty

Test liquid	Penetration index (%)1	Repellency index (%)1
Sulphuric Acid 30%	±0.3	±0.3
O-Xylene	±5.0	±7.8

[1] On the measured value

Material tested

Assembly Woven fabric, navy blue colour + laminated non-woven fabric + non-woven fabric sewn to woven fabric, navy blue colour

Test date

30/07/2021

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RESULTS

1. Test liquid Sulphuric acid 30%
Trade name SCHARLAU (Ref: AC20791000)
Boiling point 336.85 ºC
Evaporative losses prevision None

Direction	Specimen	Penetration index (%)	Repellency index (%)	Absorption index (%)
Warp	1	0.0	99.4	0.6
Weft	1	0.0	99.7	0.3

2. Líquido de ensayo o-Xileno
Test liquid *o-Xylene*
Nombre comercial SCHARLAU (Ref: XI00252500)
Trade name
Punto ebullición 139 ºC
Boiling point
Previsión para las pérdidas evaporativas Ninguna
Evaporative losses prevision *None*

Direction	Specimen	Penetration index (%)	Repellency index (%)	Absorption index (%)
Warp	1	0.0	92.7	7.3
Weft	1	0.0	95.3	4.7

REQUIREMENTS ACCORDING TO STANDARD UNE-EN 469:2020

The limits set by the Standard EN 469:2020 point (6.2.2) are: shall give no penetration to the innermost surface and a repellency rate ≥ 80% in each chemical tested.

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RESULTS

WATER PENETRATION RESISTANCE. TEST UNDER HYDROSTATIC PRESSURE

Standard
EN 20811:1992 (Obsolete)

Apparatus
Hydrostatic Head Tester

Conditioning date	07/07/2021	**Test date**	02/08/2021

Atmosphere for conditioning testing

Temperature	(20±2) ºC	**Relative humidity**	(65±4) %

Water temperature
20 ºC

Rate of increase of water pressure
10cmH_2O/min ((980±50) Pa/min)
The test equipment applies the water pressure to the exposed surface from below.

Surface exposed
External side

Previous treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference
Tesafire Fighter Suit 0025

Specimen	Pressure (cmH_2O)	Pressure (Pa)	Less Pressure
1	28,9	2890,0	2890,0
2	29,2	2920,0	
3			
4			

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RESULTS

Remark

The edition of the standard used, does not correspond to the latest version released.

REQUISITE ACCORDING TO STANDARD EN 343:2019

	CLASS 1	CLASS 2	CLASS 3	CLASS 4
After pre-treatment	---	---	---	≥ 20000 Pa

CLASS ----

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RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date

13/07/2021 - 8/07/2021

Conditioned

24h in indoor ambient conditions at 20 ± 2 ºC and 65 ± 5 % RH

Original and after pre-treatment ambient conditions test

22,6ºC and 47,4% RH – 24,9ºC and 38,2% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Outer surface

Tested material

Seams.

Reference

Tesafire Fighter Suit 0025

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RESULTS

Pre-Treatment As received

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams open	No	No	No

Pre-Treatment 5 washing cycles at 60ºC, according to the standard EN ISO 6330:2012, method 6N and F drying (tumble dry).

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams open	No	No	No

Remark

The uncertainty of the assay of limited flame spread is ±2% of the value measured, for a coverage factor of K=2 (95%).

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RESULTS

Remark

Performance results according to EN 469:2020: The material shall achieve level 3 of EN 14116:2015 when it is tested after washing and drying pre-treatment. Seams shall not open.

PERFORMANCE LEVEL ACCORDING TO EN ISO 14116:2015	Index 3

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Seams do not open

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RESULTS

ERGONOMICS

Standard
EN ISO 13688:2013

Reference
TESAFIRE FIGHTER SUIT 0025

Test date
28/05/2021

Remark
The ergonomics verification has been performed by physical dimensions commensurate with the size found.

According to the inspection of the garment, this fulfills ergonomics requirement.

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RESULTS

SIZING

Standard
EN ISO 13688:2013 Apdo. 6

Test uncertainty
The test uncertainty is ±1% of the measurand's value, for a coverage value of K=2 (95%)

Size
XL

Reference	TESAFIRE FIGHTER SUIT 0025	
Bust girth (cm)	**Arm height (cm)**	**Back height (cm)**
132,0	64,0	82,0

Remark: The size XL corresponds to:

User height: 176-182 cm.
User bust girth: 104-116 cm.

AFTER CHECKING THE SIZES, THESE ARE CONSIDERED ACCEPTABLE

Start and finish test date
31/05/2021 - 31/05/2021

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RESULTS

DETERMINATION OF PH VALUE

Standard
EN ISO 3071:2020

Determination date
04/05/2021

Extractor solution
A - H_2O

pH Extractor solution
7,00

Temperature
20.5 ºC

Reference	pH	Uncertainty
TESAFIRE FIGHTER SUIT 0025 (AUTOENGAGEABLE FABRIC)	7.50	± 5 %

REQUISITE
In accordance with Standard EN ISO 13688:2013, the pH value shall be greater than 3.5, and less than 9.5.

PASS

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RESULTS

DETERMINATION OF FORBIDDEN AZO COLORANTS (CANCEROGENIC ARYLAMINES)

Standard
UNE-EN 14362-1:2017

Test Methods
GC/MSD

Apparatus
Gas Chromatograph 7890A

Uncertainty
± 9 mg/Kg

Detectors
Mass Spectrometer 5975C

Reference	Results
TESAFIRE FIGHTER SUIT 0025 (AUTOENGAGEABLE FABRIC)	< 30* mg/Kg
	*For all forbidden azo dyes listed below.
The textile products subject to control are according to the Standard EN ISO 13688:2013 on the use of Azo Colorants which release carcinogenic amines listed in the Standard Test	

PASS

Forbidden Azo dyes
4-Aminodiphenyl, Benzidine, 4-Chlor-o-toluidine, 2-Naphthylamine, o-Aminoazotoluene, 2-Amino-4-nitrotoluene, p-Chloraniline, 2,4-Diaminoanisole, 4,4'-Diaminodiphenylmethane, 3,3'-Dichlorobenzidine, 3,3'-Dimethoxybenzidine, ,3,3'-Dimethylbenzidine, 3,3'-Dimethyl-4,4'-diaminodiphenylmethane, p-Cresidine, 4,4'-Methylene-bis-2-chloraniline, 4,4'-Oxydianiline, 4,4'-Thiodianiline, o-Toluidine, 2,4- Toluylenediamine, 2,4,5-Trimethylaniline, o-Anisidine, 4-Aminoazobenzene

REQUISITE
In accordance with standard EN ISO 13688:2013, by detecting Azo colorants the limited stablished is not detected by standard EN 14362-1

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RESULTS

SPECIFIC DESIGN REQUIREMENTS

REFERENCE

TESAFIRE FIGHTER SUIT 0025

STANDARD

EN 340:2003 and EN ISO 13688:2013

DESIGN REQUIREMENTS

The protection clothing design makes easy its correct placement and wearing staying with no movement during the use period intended.	**PASS**
The design of the protective clothing applies elements from other protective or equipment clothing, which are used to create a comprehensive protective outfit.	**PASS**
The clothing has no rough, sharp or hard surfaces or edges that could damage or irritate the user.	**PASS**
The clothing is not enough narrow for causing flow blood restriction.	**PASS**
The clothing is not enough loose and heavy for interfering the user's movement.	**PASS**

Remark
N/A: Not applicable

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RESULTS

SPECIFIC DESIGN REQUIREMENTS

REFERENCE

TESAFIRE FIGHTER SUIT 0025

STANDARD

EN 469:2020

DESIGN REQUIREMENTS

The garment fulfils the requirements set out in the ISO 13688 guideline.	**PASS**
Firefighter's protective clothing shall be designed to provide protection for the firefighter's torso, neck, arms to the wrists, and legs to the ankles.	**PASS**
The levels of performance can be achieved by a garment assembly which may contain multilayer materials or material combinations.	**PASS**
If separate garment(s) (e.g. station wear, polo-shirt) are combined with turn-out gear, to meet the protection levels, they shall be tested together to meet the minimum requirements of this document. Any change, of for example the undergarment (e.g. different manufacturer or composition), invalidates the compliance with the requirements of this document including the marking.	**N/A**
If present the inspection access(es) shall be closed by a means that cannot be opened accidentally.	**PASS**
Retro-reflective, fluorescent shall give all round visibility and shall as a minimum encircle the arms, legs and torso regions of the protective clothing.	**PASS**
Where protection is provided by a two piece suit, it shall be determined that an overlap between the jacket and trousers shall always be retained, whilst raising both hands fully above the head and bending over from an upright position until fingertips reach the ground without bending the knees. The wrists and ankles shall remain covered, when wearing appropriate sized clothing in an upright position.	**PASS**
The discontinuous closure system (e.g. buttonholes or press-fasteners) shall not lead to unprotected openings in the garment. If zippers are used, the slide fastener shall be designed to lock when completely closed including when using a fast release mechanism zipper. The closure system shall not open accidentally.	**PASS**

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RESULTS

SPECIFIC DESIGN REQUIREMENTS

DESIGN REQUIREMENTS

All external pocket flaps shall be stitched down or capable of fastening the pocket closed. They shall be 20 mm wider than the opening (10 mm on each side). Exception is possible for radio pockets and side pockets below the waist which do not extend more than 10° forward of the side seam. All pockets in the garment shall be designed in such a way to prevent entry of heat, flame, or hot material, exception for external radio pockets.	**PASS**
Any anti-wicking barrier used in a garment, the width of material shall not exceed 10 cm for jackets and 15 cm for trousers.	**N/A**
For any drain mesh material used, the width shall not exceed the 3 cm.	**N/A**
Hardware penetrating the outer material shall not be exposed on the innermost surface of the garment or garment assembly. Protective clothing shall be designed to ensure that the hardware shall not have sharp edges, roughness or projections which are likely to cause injury to the wearer.	**PASS**
Any devices that are integrated (whether permanently fixed or not), the interfaced areas or areas of interaction shall be designed so that the level of protection is maintained and shall be tested together with the garment.	**N/A**

Remark
N/A: Not applicable

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RESULTS

PRE-TREATMENT FOR DOMESTIC WASHING AND DRYING PROCEDURES FOR TEXTILE TESTING

Standard
ISO 6330:2012

Standard deviation

Reference
Sample1 TESAFIRE FIGHTER SUIT 0025

Units	1	2	3	4	5
Equipment	Wascator 13471E05	Wascator 13474E05	Wascator 13151E12	Wascator 13097E12	Wascator 13470E05
Dryer machine	JAMES HEAL 13473E05	JAMES HEAL 13475E05	ELECTROLUX 13426E12	ELECTROLUX 13425E12	JAMES HEAL 13472E05

Washing procedure 6N **Washing cycles** 5

Drying procedure
F (tumble dryer)

Washing powder
ECE detergent 98 + sodium perborate + TAED

Units	Dry mass of the samples	Counterweight mass	Equipment
1	2.10 Kg	---	Wascator 13471E05
2	1.98 Kg	---	Wascator 13474E05
3	1.96 Kg	0,05 Kg of Polyester	Wascator 13151E12
4	1.90 Kg	0,10 Kg of Polyester	Wascator 13097E12
5	2.00 Kg	---	Wascator 13470E05

Start and finish date
06/05/2021 - 07/05/2021

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RESULTS

DETERMINATION OF DIMENSIONAL CHANGE IN DOMESTIC WASHING AND DRYING

Standard
EN ISO 5077:2008

Standard deviation

Preparation, marking and measuring of fabric specimens according to EN ISO 3759:2011
Starting test date 29/04/2021 **Ending test date** 18/05/2021

Washing procedure
6N (T^a = 60 ± 3ºC); Total dry load test samples and the counterweight 2 ± 0.1 Kg) according to ISO 6330:2012

Used apparatus
Wascator type A-Horizontal drum, front loading (13471E05)

Detergent
98 ECE reference detergent without optical brightener.

Counterweight
Type III - 100% polyester

Number of washing cycles
5

Dryer type
A3

Procedure F – Tumble dry(13473E05)

Uncertainty of test (% of the measured value)
± 0.5 %

Reference	Specimen		Direction	Dimensional change (%)
TESAFIRE FIGHTER SUIT 0025 EXTERNAL FABRIC		1	Warp	-2,0
			Weft	-1,0
TESAFIRE FIGHTER SUIT 0025 INTERNAL FABRIC		1	Warp	-2,0
			Weft	-2,0

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RESULTS

REMARK

Negative dimensional change indicates shrinkage
Positive dimensional change indicates lengthening

REQUISITE

In accordance with the Standard EN ISO 13688:2013, the dimensional change shall not exceed ± 3%, both in width warp and in length weft.

PASS

REQUISITE

In accordance with the Standard EN 469:2020, the dimensional change shall not exceed ± 3%, both in width warp and in length weft.

PASS

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RESULTS

LIMITED FLAME SPREAD

Standard
EN ISO 15025:2016 (Method A)

Apparatus
Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date
11/05/2021 - 24/05/2021

Conditioned
24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Original and after pre-treatment ambient conditions test
21,7ºC and 33,7% RH - 20,5ºC and 52,6% RH

Gas used
Propane gas

Deviation from the standard

Face exposed to the flame
Surfaces: Outer

Tested material
Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty
The uncertainty of the assay of limited flame spread is ±2% of the value measured, for a coverage factor of K=2 (95%).

Reference
TESAFIRE FIGHTER SUIT 0025

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RESULTS

Pre-Treatment As received

Specimen	1	2	3	4	5	6
Direction		Warp			Weft	
Flaming to top or either side edge	No	No	No	No	No	No
After flame time (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Melting	No	No	No	No	No	No
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No

Pre-Treatment 5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Specimen	1	2	3	4	5	6
Direction		Warp			Weft	
Flaming to top or either side edge	No	No	No	No	No	No
After-flame time (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Melting	No	No	No	No	No	No
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No

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RESULTS

Performance results according to EN 469:2020. The material shall achieve level 3 of EN ISO 14116:2015 when it is tested.

PERFORMANCE LEVEL ACCORDING TO EN IS 14116:2015	Index 3

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s

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RESULTS

LIMITED FLAME SPREAD

Standard
EN ISO 15025:2016 (Method A)

Apparatus
Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date
11/05/2021 - 24/05/2021

Conditioned
24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Original and after pre-treatment ambient conditions test
21,7ºC and 33,7% RH - 20,5ºC and 52,6% RH

Gas used
Propane gas

Deviation from the standard

Face exposed to the flame
Surfaces: Inner

Tested material
Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty
The uncertainty of the assay of limited flame spread is ±2% of the value measured, for a coverage factor of K=2 (95%).

Reference
TESAFIRE FIGHTER SUIT 0025

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RESULTS

Pre-Treatment As received

Specimen	1	2	3	4	5	6
Direction		Warp			Weft	
Flaming to top or either side edge	No	No	No	No	No	No
After flame time (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Melting	No	No	No	No	No	No
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No

Pre-Treatment 5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Specimen	1	2	3	4	5	6
Direction		Warp			Weft	
Flaming to top or either side edge	No	No	No	No	No	No
After-flame time (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Melting	No	No	No	No	No	No
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No

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RESULTS

Performance results according to EN 469:2020. The material shall achieve level 3 of EN ISO 14116:2015 when it is tested.

PERFORMANCE LEVEL ACCORDING TO EN IS 14116:2015	Index 3

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s

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RESULTS

LIMITED FLAME SPREAD

Standard
EN ISO 15025:2016 (Method A)

Apparatus
Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date
11/05/2021 - 13/05/2021

Conditioned
24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Original and after pre-treatment ambient conditions test
21,6ºC and 34,4% RH - 22,4ºC and 38,1% RH

Gas used
Propane gas

Deviation from the standard

Face exposed to the flame
Surfaces: Outer seams

Tested material
Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty
The uncertainty of the assay of limited flame spread is ±2% of the value measured, for a coverage factor of K=2 (95%).

Reference
TESAFIRE FIGHTER SUIT 0025

_____>>>

RESULTS

Pre-Treatment As received

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams separation	No	No	No

Pre-Treatment 5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After-flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams separation	No	No	No

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RESULTS

Performance results according to EN 469:2020. The material shall achieve level 3 of EN ISO 14116:2015 when it is tested.

PERFORMANCE LEVEL ACCORDING TO EN IS 14116:2015	Index 3

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Seams do not separate

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RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

After pre-treatment test date

08/06/2021

Conditioned

24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

After pre-treatment ambient conditions test

21,6ºC and 57,9% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Outer surface

Tested material

Hardware: Elastic band, plastic closure of the braces.

Test uncertainty

The uncertainty of the assay of limited flame spread is ±2% of the value measured, for a coverage factor of K=2 (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

_____>>>

RESULTS

Pre-Treatment 5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F (tumble dry)

Hardware	Elastic band			Plastic closure of the braces		
Flaming to top or either side edge	No	No	No	No	No	No
Post- After flame (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No
Closures can be opened	---	---	---	Yes	Yes	Yes

Performance results according to EN 469:2020. The material shall achieve level 3 to standard EN ISO 14116:2015 when it is tested after washing and drying pre-treatment.

PERFORMANCE LEVEL ACCORDING TO STANDARD EN ISO 14116:2015	Index 3

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Hardware must continue working

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RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

After pre-treatment test date

08/06/2021

Conditioned

24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

After pre-treatment ambient conditions test

21,6ºC and 57,5% RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Outer surface

Tested material

Hardware: Metallic push button of the trousers, self-fastening tape of the trousers.

Test uncertainty

The uncertainty of the assay of limited flame spread is ±2% of the value measured, for a coverage factor of K=2 (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

_____>>>

RESULTS

Pre-Treatment 5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F (tumble dry)

Hardware	Metallic push button of the trousers			Self-fastening tape of the trousers		
Flaming to top or either side edge	No	No	No	No	No	No
Post- After flame (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No
Closures can be opened	Yes	Yes	Yes	Yes	Yes	Yes

Performance results according to EN 469:2020. The material shall achieve level 3 to standard EN ISO 14116:2015 when it is tested after washing and drying pre-treatment.

PERFORMANCE LEVEL ACCORDING TO STANDARD EN ISO 14116:2015	Index 3

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Hardware must continue working

_____///

RESULTS

LIMITED FLAME SPREAD

Standard

EN ISO 15025:2016 (Method A)

Apparatus

Equipment for determination of limited flame spread 13008IE12

After pre-treatment test date

08/06/2021

Conditioned

24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

After pre-treatment ambient conditions test

21,8ºC and 55,0 RH

Gas used

Propane gas

Deviation from the standard

Face exposed to the flame

Outer surface

Tested material

Hardware: Metallic push button of the pocket, self-fastening tape of the pocket.

Test uncertainty

The uncertainty of the assay of limited flame spread is ±2% of the value measured, for a coverage factor of K=2 (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

_____>>>

RESULTS

Pre-Treatment 5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F (tumble dry)

Hardware	Metallic push button of the pocket			Self-fastening tape of the pocket		
Flaming to top or either side edge	No	No	No	No	No	No
Post- After flame (s)	0	0	0	0	0	0
Afterglow time (s)	0	0	0	0	0	0
Loose waste	No	No	No	No	No	No
Inflammation of the filter paper detached from waste	No	No	No	No	No	No
Hole formation	No	No	No	No	No	No
Closures can be opened	Yes	Yes	Yes	Yes	Yes	Yes

Performance results according to EN 469:2020. The material shall achieve level 3 to standard EN ISO 14116:2015 when it is tested after washing and drying pre-treatment.

PERFORMANCE LEVEL ACCORDING TO STANDARD EN ISO 14116:2015	Index 3

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Hardware must continue working

_____///

RESULTS

CONTACT HEAT

Standard

EN ISO 12127-1:2015

Apparatus

ÖTI CONTACT HEAT PROTECTION TESTER

Conditioned

24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Ambient conditions test

24,0 ºC and 34,4 % RH

Pre-Treatment

As received

Deviation from the Standard

Test date

07/05/2021

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty

The uncertainty of the contact heat test is ± 2% of the value obtained, for a coverage factor of K = 2 (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

>>>

RESULTS

Specimen	Contact temperature (ºC)	Threshold time (s)
1	250	14,30
2	250	14,22
3	250	14,41
Classification value	**250**	**14**

PERFORMANCE LEVEL ACCORDING TO EN 469:2020 LEVEL 2

Remark

The assembly shall be classified according to the lowest single result of three individual values and rounded to the nearest whole second (s) is the obtained result.

Results in accordance with Standard EN 469:2020 for the level 2

Contact temperature (ºC)	Threshold time (s)
250	≥ 10,0

_____///

RESULTS

CONTACT HEAT

Standard

EN ISO 12127-1:2015

Apparatus

ÖTI CONTACT HEAT PROTECTION TESTER

Conditioned

24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Ambient conditions test

21,7 ºC and 47,9 % RH

Pre-Treatment

5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Deviation from the Standard

Test date

18/05/2021

Tested material

Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty

The uncertainty of the contact heat test is ± 2% of the value obtained, for a coverage factor of K = 2 (95%).

Reference

TESAFIRE FIGHTER SUIT 0025

_____>>>

RESULTS

Specimen	Contact temperature (ºC)	Threshold time (s)
1	250	16,02
2	250	15,52
3	250	15,67
Classification value	**250**	**16**

PERFORMANCE LEVEL ACCORDING TO EN 469:2020 LEVEL 2

Remark

The assembly shall be classified according to the lowest single result of three individual values and rounded to the nearest whole second (s) is the obtained result.

Results in accordance with Standard EN 469:2020 for the level 2

Contact temperature (ºC)	Threshold time (s)
250	≥ 10,0

_____///

RESULTS

METHOD OF DETERMINING HEAT TRANSMISSION ON EXPOSURE TO FLAME

Standard
ISO 9151:2016

Apparatus
Convective heat

Heat flux density
80,02 kW/m^2

Pre-Treatment
As received

Conditioned
24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Ambient conditions test
23,7 ºC and 44,6 % RH

Deviation from the Standard

Test date
04/05/2021

Tested material
Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

>>>

RESULTS

Reference	Specimen	HTI_{12} (s)	HTI_{24} (s)	HTI_{24} - HTI_{12} (s)
TESAFIRE FIGHTER SUIT 0025	1	11,1	15,7	4,6
	2	10,8	15,3	4,5
	3	11,3	15,9	4,5
	Result	11	15	4

Remark

The uncertainty of the assay of Convective heat is ±4% of the value measured, for a coverage factor of K=2 (95%).

Remark

Result obtained of the lowest individual value according to EN 469:2020

PERFORMANCE LEVEL ACCORDING TO STANDARD EN 469:2020	LEVEL 2

Results in according with standard EN 469:2020

Heat transfer index	Performance level 1	Performance level 2
HTI_{24}	≥ 9,0	≥ 13,0
HTI_{24} - HTI_{12}	≥ 3,0	≥ 4,0

Results have been obtained according a test method with pretenders only the classification of the materials, and are not necessary the application of the conditions.

_____///

RESULTS

METHOD OF DETERMINING HEAT TRANSMISSION ON EXPOSURE TO FLAME

Standard
ISO 9151:2016

Apparatus
Convective heat

Heat flux density
79,03 kW/m^2

Pre-Treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Conditioned
24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Ambient conditions test
25,7 ºC and 41,9 % RH

Deviation from the Standard

Test date
17/05/2021

Tested material
Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

_____>>>

RESULTS

Reference	Specimen	HTI_{12} (s)	HTI_{24} (s)	HTI_{24} - HTI_{12} (s)
TESAFIRE FIGHTER SUIT 0025	1	11,5	16,1	4,6
	2	11,7	16,4	4,7
	3	11,3	16,1	4,8
	Result	11	16	5

Remark

The uncertainty of the assay of Convective heat is ±4% of the value measured, for a coverage factor of K=2 (95%).

Remark

Result obtained of the lowest individual value according to EN 469:2020

PERFORMANCE LEVEL ACCORDING TO STANDARD EN 469:2020	LEVEL 2

Results in according with standard EN 469:2020

Heat transfer index	Performance level 1	Performance level 2
HTI_{24}	≥ 9,0	≥ 13,0
HTI_{24} - HTI_{12}	≥ 3,0	≥ 4,0

Results have been obtained according a test method with pretenders only the classification of the materials, and are not necessary the application of the conditions.

_____///

RESULTS

RADIANT HEAT

Standard
EN ISO 6942:2002, method B

Apparatus
Equipment for the determination of radiant heat

Heat flux density
40,05 kW/m^2

Pre-Treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Conditioned
24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Ambient conditions test
25,7 ºC and 41,9 % RH

Deviation from the Standard

Test date
17/05/2021

Tested material
Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

_____>>>

RESULTS

Reference	TESAFIRE FIGHTER SUIT 0025			
Specimen	TF	RHTI 12 (s)	RHTI 24 (s)	(RHTI 24 - RHTI 12) (s)
1	32,4	10,0	15,1	5,1
2	31,2	10,6	15,9	5,3
3	31,8	10,2	15,4	5,2
Result	32	10	15	5

Remark

The uncertainty of the assay of Radiant heat is ±3,5% of the value measured, for a coverage factor of K=2 (95%).

PERFORMANCE LEVEL ACCORDING TO EN 469:2020	LEVEL 1

Remark

The assembly shall be classified according to the lowest single result of three individual values and rounded to the nearest whole second (s) is the obtained result**.**

Requirements to meet according to EN 469:2020

Heat transfer index	Performance level 1	Performance level 2
RHTI 24	≥ 10,0	≥ 18,0
RHTI 24 - RHTI 12	≥ 3,0	≥ 4,0

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RESULTS

RADIANT HEAT

Standard
EN ISO 6942:2002, method B

Apparatus
Equipment for the determination of radiant heat

Heat flux density
39,98 kW/m^2

Pre-Treatment
As received.

Conditioned
24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Ambient conditions test
23,7 ºC and 44,6 % RH

Deviation from the Standard

Test date
04/05/2021

Tested material
Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

>>>

RESULTS

Reference	TESAFIRE FIGHTER SUIT 0025			
Specimen	TF	RHTI 12 (s)	RHTI 24 (s)	(RHTI 24 - RHTI 12) (s)
1	34,9	9,7	14,7	5,0
2	35,2	9,2	13,9	4,7
3	33,1	9,9	14,9	5,0
Result	35	9	14	5

Remark

The uncertainty of the assay of Radiant heat is ±3,5% of the value measured, for a coverage factor of K=2 (95%).

PERFORMANCE LEVEL ACCORDING TO EN 469:2020	LEVEL 1

Remark

The assembly shall be classified according to the lowest single result of three individual values and rounded to the nearest whole second (s) is the obtained result.

Requirements to meet according to EN 469:2020

Heat transfer index	Performance level 1	Performance level 2
RHTI 24	≥ 10,0	≥ 18,0
RHTI 24 - RHTI 12	≥ 3,0	≥ 4,0

_____///

RESULTS

PRE-TREATMENT

Reference
TESAFIRE FIGHTER SUIT 0025

Type of specimen
Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Number of specimens
6

Conditioned
24h in indoor ambient conditions at 20 ± 2 ºC and 65 ± 5 % HR

Deviation from the Standard

Used apparatus
Equipment for determination of radiant heat

Pretreatments	Test standard	Test data	Method	Test time
Radiant heat	EN ISO 6942:2002	17/05/2021	A	180

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RESULTS

DETERMINATION OF BREAKING STRENGTH AND ELONGATION

Standard
EN ISO 13934-1:2013

Apparatus
INSTRON Dynamometer

Conditioning date 18/05/2021 **Test date** 26/05/2021

Atmosphere for conditioning testing
Temperature (20±2) ºC **Relative humidity** (65±5) %

Nº of specimens
Tested 3 for each direction **Rejected** 0

Gauge length
200 mm

Test velocity
100 mm/min

Pretension
Warp 5 N **Weft** 5 N

State of the specimens
Conditioned

Previous treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry), exposed to the Radiant heat according to method A, EN ISO 6942:2002

Reference
TESAFIRE FIGHTER SUIT 0025

Direction	Maximum average load (N)	C.V. (%)	Average elongation (%)	C.V. (%)
Warp	1100 1100 1100 1100	1.0	17.5 17.5 18.0 19.0	4.4
Weft	1100 1000 1000 1000	2.0	12.5 12.0 12.5 12.5	1.6

_____>>>

RESULTS

Remark

The relative expanded uncertainty of Tensile strength resistance is ±5% assay value of the measured, for a probability of coverage of 95%.

Reporting requirements attached:

REQUISITE ACCORDING TO STANDARD EN 469:2020

The external material must resist a breaking load in both directions ≥ 450 N.

_____///

RESULTS

HEAT RESISTANCE

Standard
ISO 17493:2016

Apparatus
Air stove

Temperature
(180 ± 5) ºC

Length of the test
5 min (+0,15/-0) min

Deviation from the Standard

Pre-Treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Tested material
External (Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.)

Reference
TESAFIRE FIGHTER SUIT 0025

_____>>>

RESULTS

Fabric				
Flame	Melting	Direction	Shrink(-) / Elongation(+)	
No	No	Warp		-0,6 %
		Weft		0,0 %
No	No	Warp		-0,8 %
		Weft		-0,4 %
No	No	Warp		-0,4 %
		Weft		-0,5 %

Remark

The uncertainty of the assay of Heat Resistance is ±12% of the value measured, for a coverage factor of K=2 [95%].

PERFORMANCE LEVEL ACCORDING TO EN 469:2020	PASS

Requirements to meet according to EN 469:2020

No layer can ignite
No layer can melt
No layer shrinks more than 5%

_____///

RESULTS

HEAT RESISTANCE

Standard
ISO 17493:2016

Apparatus
Air stove

Temperature
(180 ± 5) ºC

Length of the test
5 min (+0,15/-0) min

Deviation from the Standard

Test uncertainty
The uncertainty of the assay of heat resistence is ±12% of the value measured, for a coverage factor of K=2 (95%)

Pre-Treatment
As received.

Tested material
Hardware: Main self-fastening material, main metal zipper with metallic cursor, reflective tape, cuff fabric, self-fastening material of the pocket, self-fastening material of the cuff, metallic push button, self-fastening material of the trousers, metallic push button of the trousers, elastic strap, plastic strap closure.

Reference
TESAFIRE FIGHTER SUIT 0025

_____>>>

RESULTS

Accesories				
Hardware	**Flame**	**Melting**	**Separation**	**Hardware work correctly**
Main self-fastening material	No	No	No	Yes
Main metal zipper with metallic cursor	No	No	No	Yes
Reflective tape	No	No	No	Yes
Cuff fabric	No	No	No	Yes
Self-fastening material of the pocket	No	No	No	Yes
Self-fastening material of the cuff	No	No	No	Yes
Metallic push button	No	No	No	Yes
Self-fastening material of the trousers	No	No	No	Yes
Elastic strap	No	No	No	Yes
Plastic strap closure	No	No	No	Yes
Metallic push button of the trousers	No	No	No	Yes

PERFORMANCE LEVEL ACCORDING TO EN 469:2020	**PASS**

Requisites to meet according to EN 469:2020

No hardware/strip/seam shall ignite or melt
Closures opens

_____///

RESULTS

MASS PER UNIT AREA

Standard
EN 12127:1997; pto. 8.3

Conditioning date 29/04/2021 **Test date** 30/04/2021

Atmosphere for conditioning testing
Temperature (20±2) ºC **Relative humidity** (65±2) %

State of the specimens
Original

Reference	Mass per unit area (g/m^2)	CV (%)
TESAFIRE FIGHTER SUIT 0025	466	0,7

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RESULTS

DETERMINATION OF BREAKING STRENGTH AND ELONGATION

Standard
EN ISO 13934-1:2013

Apparatus
INSTRON Dynamometer

Conditioning date 12/05/2021 **Test date** 26/05/2021

Atmosphere for conditioning testing
Temperature (20±2) ºC **Relative humidity** (65±4) %

Gauge length
Warp 200 mm. **Weft** 200 mm.

Test velocity
Warp 100 mm/min **Weft** 100 mm/min

Pretension
Warp 5 N **Weft** 5 N

Nº of specimens
Tested 5 for each direction **Rejected** 0
State of the specimens Conditioned

Previous treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference
TESAFIRE FIGHTER SUIT 0025

Direction	Maximum average load (N)	C.V. (%)	Average elongation (%)	C.V. (%)
Warp	1100 1200 1100 1100 1100 1100	2.0	16.5 16.0 17.0 16.5 16.5 17.0	1.6
Weft	1000 100 1000 1000 1000 980	2.0	12.0 11.5 12.0 12.0 11.5 12.5	2.6

>>>

RESULTS

Remark

The relative expanded uncertainty of Tensile strength resistance is ±5% assay value of the measured, for a probability of coverage of 95%.

REQUISITE ACCORDING TO STANDARD EN 469:2020

The external material must resist a breaking load in both directions ≥ 450 N.

PASS

_____///

RESULTS

SEAM STRENGTH RESISTANCE

Standard
EN ISO 13935-2:2014

Apparatus
INSTRON Dynamometer

Conditioning date	11/05/2021	**Test date**	26/05/2021

Gauge length
100 mm

Atmosphere for conditioning testing

Temperature	(20±2) ºC	**Relative humidity**	(65±4) %

Number of specimens

Tested	5	Rejected	0

The break of the seam is produced for:
Torn fabric in the seam

Previous treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference
TESAFIRE FIGHTER SUIT 0025 (External seam)

Average resistance (N)		C.V.(%)
706,40		
729,93		
786,10	755,46	4,69
772,60		
782,29		

Remarks
The relative expanded uncertainty of Seams resistance is ± 6% assay value of the measured, for a probability of coverage of 95%.

REQUISITE ACCORDING TO STANDARD EN 469:2020
The external material must resist a breaking load ≥ 300 N.

PASS

>>>

RESULTS

DETERMINATION OF TEAR RESISTANCE

Standard
EN ISO 13937-2:2000

Apparatus
INSTRON Dynamometer

Conditioning date 12/05/2021 **Test date** 26/05/2021

Atmosphere for conditioning testing
Temperature (20±2) ºC **Relative humidity** (65±5) %

Nº of specimens
Tested 5 for each direction **Rejected** 0

The calculation of averages has been made
For electronic device

Previous treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference
TESAFIRE FIGHTER SUIT 0025

Tear	Average load (N)	C.V. (%)
Lengthwise	49 48 45 49 50 51	4.9
Crosswise	49 43 46 45 45 43	5

Remark
The relative expanded uncertainty of Tear resistance is ±3.9% assay value of the measured, for a probability of coverage of 95%.

>>>

RESULTS

Observation

The test was performed with specimens of great width (200x200) mm in crosswise direction.

REQUISITE ACCORDING TO STANDARD EN 469:2020

The external material must resist a determination of tear resistance in both directions ≥ 30 N.

.

PASS

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RESULTS

WATER PENETRATION RESISTANCE. TEST UNDER HYDROSTATIC PRESSURE

Standard

EN ISO 811:2018

Apparatus

Hydrostatic Head Tester

Conditioning date	20/05/2021	**Test date**	07/06/2021

Atmosphere for conditioning testing

Temperature	(20±2) ºC	**Relative humidity**	(65±4) %
Water temperature	20 ºC	**Rate of increase of water pressure**	10 cmH_2O/min

The test equipment applies the water pressure to the exposed surface from below.

Surface exposed

External side

Previous treatment

5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Reference

TESAFIRE FIGHTER SUIT 0025

Specimen	Pressure (cm/H_2O)	Average (cm/H_2O)	Pressure (KPa)	Media (KPa)
1	104		10,4	
2	114		11,4	
3	135	132	13,5	13,2
4	186		18,6	
5	119		11,9	

REQUISITE ACCORDING TO STANDARD EN 469:2020

Y1 < 20 kPa, for garments without a moisture barrier.
Y2 ≥ 20 kPa, for garments with a moisture barrier.

PERFORMANCE LEVEL ACCORDANCE WITH EN 469:2020	**---**

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RESULTS

RESISTANCE OF MATERIALS TO PENETRATION BY LIQUID

Standard
EN ISO 6530:2005

Atmosphere for conditioning and testing

Temperatura *Temperature*	(20±2) ºC	**Humedad Relativa (HR)** *Relative Humidity (RH)*	(65±5) %

Flow
10 ml in 10 s

Mass per unit area approximate of the sample tested
Does not provided by the customer

Pre-treatment
5 washing cycles at 60ºC, according to the standard ISO 6330:2012, method 6N and F drying

Reference
TESAFIRE FIGHTER SUIT 0025

Measurement uncertainty

Test liquid	Penetration index (%)1	Repellency index (%)1
Sulphuric Acid 30%	±0.3	±0.3
O-Xylene	±5.0	±7.8

[1] On the measured value

Material tested
Assembly: Outer woven fabric, navy blue colour + Intermediate laminated non-woven fabric + Inner non-woven fabric sewn to a woven fabric, grey colour

Test date
19/05/2021

_____>>>

RESULTS

1. Test liquid Sulphuric acid 30%
Trade name SCHARLAU (Ref: AC20791000)
Boiling point 336.85 ºC
Evaporative losses prevision None

Direction	Specimen	Penetration index (%)	Repellency index (%)	Absorption index (%)
Warp	1	0.0	99.3	0.7
	2	0.0	99.7	0.3
	3	0.0	99.2	0.8
Weft	1	0.0	99.7	0.3
	2	0.0	99.8	0.2
	3	0.0	99.7	0.3

2. Líquido de ensayo o-Xileno
Test liquid *o-Xylene*
Nombre comercial SCHARLAU (Ref: XI00252500)
Trade name
Punto ebullición 139 ºC
Boiling point
Previsión para las pérdidas evaporativas Ninguna
Evaporative losses prevision *None*

Direction	Specimen	Penetration index (%)	Repellency index (%)	Absorption index (%)
Warp	1	0.0	93.8	6.2
	2	0.0	95.9	4.1
	3	0.0	96.6	3.4
Weft	1	0.0	86.5	13.5
	2	0.0	96.8	3.2
	3	0.0	94.4	5.6

ACCORDING TO STANDARD EN 469:2020	PASS

REQUIREMENTS ACCORDING TO STANDARD UNE-EN 469:2020
The limits set by the Standard EN 469:2020 point (6.2.2) are: shall give no penetration to the innermost surface and a repellency rate ≥ 80% in each chemical tested.

_____///

RESULTS

WATER PENETRATION RESISTANCE. TEST UNDER HYDROSTATIC PRESSURE

Standard

EN ISO 811:2018

Apparatus

Hydrostatic Head Tester

Conditioning date	11/05/2021	**Test date**	25/05/2021

Atmosphere for conditioning testing

Temperature	(20±2) ºC	**Relative humidity**	(65±4) %
Water temperature	20 ºC	**Rate of increase of water pressure**	10 cmH_2O/min

The test equipment applies the water pressure to the exposed surface from below.

Surface exposed

External side

Previous treatment

5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type drying (tumble dry)

Reference

TESAFIRE FIGHTER SUIT 0025 (SEAMS)

Specimen	Pressure (cm/H_2O)	Average (cm/H_2O)	Pressure (KPa)	Media (KPa)
1	124		12,4	
2	140		14,0	
3	159	110,7	15,9	11,07
4	64,3		6,43	
5	66,2		6,62	

REQUISITE ACCORDING TO STANDARD EN 469:2020

Y1 < 20 kPa, for garments without a moisture barrier.
Y2 ≥ 20 kPa, for garments with a moisture barrier.

PERFORMANCE LEVEL ACCORDANCE WITH EN 469:2020	**---**

_____///

RESULTS

WATER VAPOUR RESISTANCE

Standard

EN ISO 11092:2014

Test date

24/06/2021

Uncertainty of the measurement

± 7% of the result for a coverage factor of K=2 (95%).

Observation or deviation from the Standard

Apparatus

12060IE05

Test atmosphere

	Temperature	(35.0±0.5) ºC
	Relative humidity	(40±3) %
Conditioning		
	Temperature	(35.0±0.5) ºC
	Relative humidity	(40±3) %
	Time	24 hours

Sample description

Navy woven fabric + yellow laminated non-woven fabric + yellow non-woven fabric seamed to navy lining.

Disposition test specimens

The membrane of yellow laminated non-woven fabric is oriented to inside.

Pre-treatment

5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying.

RESULTS

Test results

Reference	Specimen	Water vapour resistance R_{et} (m^2Pa/W)
TESAFIRE FIGHTER SUIT 0025	**Specimen 1**	12,51
	Specimen 2	13,03
	Specimen 3	13,09
	Average	**12,86**

According to the requirements of EN 469:2020 standard, water vapour resistance shall be in accordance with the following table:

Z1	45 m^2·Pa/W ≥ Ret > 30 m^2·Pa/W
Z2	Ret ≤ 30 m^2·Pa/W

GRADE Z2

RESULTS

DETERMINATION OF THE AREAS OF VISIBLE MATERIALS

Standard
EN 469:2020

Test uncertainty
$\pm 1{,}5 \cdot 10^{-4} m^2$

Reference	TESAFIRE FIGHTER SUIT 0025	
Size	**Background material (m^2)**	**Retroreflective material (m^2)**
S	0,20	0,13

ACCORDING TO EN 469: 2020 PASS

Requirements for minimum surface of visible material in m^2 according to EN 469: 2020 point 6.2.6

Background material (m^2)	≥ 0,20
Retroreflective material (m^2)	≥ 0,13

_____///

RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Standard
CIE 54.2 modified by EN ISO 20471:2013/A1:2016 section 7.3

Apparatus
Optronik rms 10 retroreflectotemer 13320E06

Light lamp	CIE standard Iluminant A
Measurement distance	A=15 m B= 16 m

To determine the retroreflection coefficient is considered

ε1 = 0º vertical retroreflective strips
ε2 = 90º Horizontal retroreflective strips.

Deviation from the Standard
Test was carried out as result verification only at Observation / Entrance angles 12' / 5º

>>>

RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Reference	TESAFIRE FIGHTER SUIT 0025
Pre-treatment	As received
Sample size	60 cm^2
Measurement distance	A
Date test	26/05/2021

Observation angle Entrance angle	Position	Test results (cd/lx·m2)
12' / 5º	ε1 = 0º vertical	343,3
12' / 5º	ε2 = 90º horizontal	348,5

Remark:
The uncertainty of the assay of retroreflective photometric performance is ±2% of the value measured, for a coverage factor of K=2 (95%).

Minimum coefficient of retroreflection in cd/(lx m2) for separate performance retroreflective material according to section 6.1 of standard EN ISO 20471:2013/A1.2016

Observation angle	Entrance angle			
	5º	20º	30º	40º
12'	330	290	180	65
20'	250	200	170	60
1º	25	15	12	10
1º30'	10	7	5	4

///

RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Standard
CIE 54.2 modified by EN ISO 20471:2013/A1:2016 section 7.3

Apparatus
Optronik rms 10 retroreflectotemer 13320E06

Light lamp CIE standard Iluminant A

Measurement distance A=15 m
B= 16 m

To determine the retroreflection coefficient R(cd/m^{2}luxes) is considered

ε1 = 0º vertical retroreflective strips
ε2 = 90º Horizontal retroreflective strips.

Deviation from the Standard
Test was carried out as result verification only at Observation / Entrance angles 12' / 5º

>>>

RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Reference	TESAFIRE FIGHTER SUIT 0025
Pre-treatment	After heat 180
Sample size	60 cm^2
Measurement distance	A
Date test	26/05/2021

Observation angle Entrance angle	Position	Test results (cd/lx·m2)
12' / 5º	ε1 = 0º vertical	222,3
12' / 5º	ε2 = 90º horizontal	215,6

Remark:
The uncertainty of the assay of retroreflective photometric performance is ±2% of the value measured, for a coverage factor of K=2 (95%).

Minimum coefficient of retroreflection in cd/(lx m2) for separate performance retroreflective material according to section 6.2.2 of standard EN ISO 20471:2013/A1:2016

Observation angle Entrance angle	Position	Separate performance retroreflective material requirement after pre- treatment
12'/ 5º	ε1 = 0º vertical	≥ **100** (cd/m^2·lx)
12'/ 5º	ε1 = 90º horizontal	

///

RESULTS

DETERMINATION OF TEMPERATURE AND ENTHALPY OF MELTING

Standard

ISO 11357-1:2016
ISO 11357-3:2018

Apparatus

Differential scanning calorimeter DSC 3+/METTLER of heat flow rate with aluminum crucible 40µl

Calibration

Calibration type	Simple
Procedure	
Standard reference materials:	Indium de 99,99999 % putity, 4,80 mg
	Zinc de 99,99998% de purity, 2,80 mg
	Tin de 99,99998% de purity, 6,00 mg

Test conditions

Gas: N_2 Grade: 99,99% Flow rate: 50ml/min

Previous conditioning

According standard EN 20139-1993 (20±2ºC y 65± 4%HR)

Number of speciments:

1

Temperaturas program

First heating cycle from 20 to 300ºC at 20ºC/min
Isotherm at 300ºC,5 minutes
Cooling cycle at 20ºC/min until 20ºC
Second heating cycle from 20 to 300ºC at 20ºC/min

_____>>>

RESULTS

DETERMINATION OF TEMPERATURE AND ENTHALPY OF MELTING

Start date test
30/04/2021

End date test
30/04/2021

Results

Reference	Heat of fusion	
TESAFIRE FIGHTER SUIT 0025 (sewing threat)	NO MELT	

Requisite

According UNE-EN 469:2020 6.2.1.7, two specimens of the sewing thread for structural seams shall be tested as received in accordance with the hot plate test in EN ISO 3146:2000 and shall not melt at a temperatura of (260 ± 5) °C.

PASS

_____///

RESULTS

HEAT RESISTANCE

Standard
ISO 17493:2016

Apparatus
Air stove

Temperature
(180 ± 5) ºC

Length of the test
5 min (+0,15/-0) min

Deviation from the Standard

Pre-Treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Tested material
Internal (Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.)

Reference
TESAFIRE FIGHTER SUIT 0025

_____>>>

RESULTS

Fabric				
Flame	Melting	Direction	Shrink(-) / Elongation(+)	
No	No	Warp		-1,6 %
		Weft		-0,1 %
No	No	Warp		-0,6 %
		Weft		-0,2 %
No	No	Warp		-1,0 %
		Weft		-0,5 %

Remark

The uncertainty of the assay of Heat Resistance is ±12% of the value measured, for a coverage factor of K=2 [95%].

PERFORMANCE LEVEL ACCORDING TO EN 469:2020	PASS

Requirements to meet according to EN 469:2020

No layer can ignite
No layer can melt
No layer shrinks more than 5%

_____///

RESULTS

LIMITED FLAME SPREAD

Standard
EN ISO 15025:2016 (Method A)

Apparatus
Equipment for determination of limited flame spread 13008IE12

Original and after pre-treatment test date
11/05/2021 - 13/05/2021

Conditioned
24h in indoor ambient conditions at (20 ± 2) ºC and (65 ± 5) % RH

Original and after pre-treatment ambient conditions test
21,6ºC and 34,4% RH - 22,4ºC and 38,1% RH

Gas used
Propane gas

Deviation from the standard

Face exposed to the flame
Surfaces: Inner seams

Tested material
Navy blue woven fabric, non-woven fabric and laminated fabric in the inner face, non-woven sewn to a grey woven fabric in the inner face.

Test uncertainty
The uncertainty of the assay of limited flame spread is ±2% of the value measured, for a coverage factor of K=2 (95%).

Reference
TESAFIRE FIGHTER SUIT 0025

_____>>>

RESULTS

Pre-Treatment As received

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After-flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams separation	No	No	No

Pre-Treatment 5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Specimen	1	2	3
Flaming to top or either side edge	No	No	No
After-flame time (s)	0	0	0
Afterglow time (s)	0	0	0
Melting	No	No	No
Loose waste	No	No	No
Inflammation of the filter paper detached from waste	No	No	No
Hole formation	No	No	No
Seams separation	No	No	No

>>>

RESULTS

Performance results according to EN 469:2020. The material shall achieve level 3 of EN ISO 14116:2015 when it is tested.

PERFORMANCE LEVEL ACCORDING TO EN IS 14116:2015	Index 3

Requirements to be met Index 3 according to EN ISO 14116:2015, point 7.3

a)The hole or the lower part of the flame mustn't reach the highest or vertical bottom of the specimen
b) No specimen shall give flaming or molten debris.
c) No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection
d) The afterflame time is ≤ 2 s
e) The afterglow time is ≤ 2 s
f) Seams do not separate

_____///

RESULTS

HEAT RESISTANCE

Standard
ISO 17493:2016

Apparatus
Air stove

Temperature
(180 ± 5) ºC

Length of the test
5 min (+0,15/-0) min

Deviation from the Standard
Fabric tested after washing.

Pre-Treatment
5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry)

Tested material
Assembly: Navy blue woven fabric, yellow non-woven sewn to grey woven fabric

Reference
Tesafire Fighter Suit 0025

_____>>>

RESULTS

Fabric				
Flame	Melting	Direction	Shrink(-) / Elongation(+)	
No	No	Warp		-1,1 %
		Weft		-1,5 %
No	No	Warp		-1,4 %
		Weft		-1,8 %
No	No	Warp		-1,2 %
		Weft		-1,2 %

Remark

The uncertainty of the assay of Heat Resistance is ±12% of the value measured, for a coverage factor of K=2 [95%].

PERFORMANCE LEVEL ACCORDING TO EN 469:2020	PASS

Requirements to meet according to EN 469:2020

No layer can ignite
No layer can melt
No layer shrinks more than 5%

_____///

RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Standard
CIE 54.2 modified by EN ISO 20471:2013/A1:2016 section 7.3

Apparatus
Optronik rms 10 retroreflectotemer 13320E06

Light lamp CIE standard Iluminant A

Measurement distance A=15 m
B= 16 m

To determine the retroreflection coefficient R(cd/m^{2}luxes) is considered

ε1 = 0º vertical retroreflective strips
ε2 = 90º Horizontal retroreflective strips.

>>>

RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Reference	Tesafire Fighter Suit 0025
Pre-treatment	After 5 washing cycles at 60ºC, according to standard EN ISO 6330:2012, method 6N and type F drying (tumble dry) + After 5 minuts Heat Resistance according to the Standard ISO 17493:2016 at 180ºC
Sample size	60 cm^2
Measurement distance	A
Date test	28/09/2021

Observation angle Entrance angle	Position	Test results (cd/lx·m2)
12' / 5º	ε1 = 0º vertical	222,9
12' / 5º	ε2 = 90º horizontal	219,9

PERFORMANCE LEVEL ACCORDING EN ISO 20471:2013/A1:2016	**PASS**

Remark:
The uncertainty of the assay of retroreflective photometric performance is ±2% of the value measured, for a coverage factor of K=2 (95%).

RequirementsAccording to the Standard EN 469:2020, point 6.2.6.4. the minimum coefficient of retroreflection for materials or combined must be in accordance to section 6.1 of standard EN ISO 20471:2013.
Minimum coefficient of retroreflection in cd/(lx m^2) for combined retroreflective material according to section 6.1 of standard EN ISO 20471:2013

Observation angle. Entrance angle	Position	Separate performance retroreflective material requirement after pre- treatment
12'/ 5º	ε1 = 0º vertical	≥ **100** (cd/m^2·lx)

///

RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Standard
CIE 54.2 modified by ISO 20471:2013/A1:2016 section 7.3

Apparatus
Optronik rms 10 retroreflectotemer 13320E06

Light lamp	CIE standard Iluminant A
Measurement distance	A=15 m B= 16 m

To determine the retroreflection coefficient is considered

ε1 = 0º vertical retroreflective strips
ε2 = 90º Horizontal retroreflective strips.

Deviation from the Standard
Test was carried out as result verification only at Observation / Entrance angles 12' / 5º

>>>

RESULTS

DETERMINATION OF RETROREFLECTIVE PHOTOMETRIC PERFORMANCE

Reference Tesafire Fighter Suit 0025

Sample size 60 cm^2

Measurement distance A

Date test 28/09/2021

Observation angle Entrance angle	Position	Test results (cd/lx·m2)
12' / 5º	ε1 = 0º vertical	343,3
12' / 5º	ε2 = 90º horizontal	348,5

PERFORMANCE LEVEL ACCORDING EN ISO 20471:2013/A1:2016 PASS

Remark:
The uncertainty of the assay of retroreflective photometric performance is ±2% of the value measured, for a coverage factor of K=2 (95%).

Minimum coefficient of retroreflection in cd/(lx m2) for separate performance retroreflective material according to section 6.1 of standard ISO 20471:2013/A1:2016

Observation angle	Entrance angle			
	5º	20º	30º	40º
12'	330	290	180	65
20'	250	200	170	60
1º	25	15	12	10
1º30'	10	7	5	4

///

Lucia Martinez
Head of PPE and Ballistics department

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